

Supplements

Table S1. List of occurrence points used to predict range.

| No | Latitude | Longitude | Source | Date |
|----|---------------|---------------|---|------------|
| 1 | 45.2511533333 | 17.7572216667 | https://www.inaturalist.org/observations/224010539 | 20.06.2024 |
| 2 | 46.797855 | 15.75227 | https://www.inaturalist.org/observations/222068130 | 11.06.2024 |
| 3 | 47.412384712 | 8.6117202044 | https://www.inaturalist.org/observations/219696325 | 01.06.2024 |
| 4 | 46.0961517165 | 25.0579459593 | https://www.inaturalist.org/observations/219094974 | 29.05.2024 |
| 5 | 46.6999883333 | 15.632875 | https://www.inaturalist.org/observations/212235670 | 27.04.2024 |
| 6 | 49.0055944444 | 21.1770333333 | https://www.inaturalist.org/observations/208520857 | 20.04.2024 |
| 7 | 45.6494507287 | 5.8811227668 | https://www.inaturalist.org/observations/193060448 | 20.04.2023 |
| 8 | 47.0987957776 | 15.4231309909 | https://www.inaturalist.org/observations/181342912 | 02.09.2023 |
| 9 | 44.8304361296 | 20.4325127229 | https://www.inaturalist.org/observations/181254593 | 20.08.2023 |
| 10 | 45.6494904247 | 5.8813943512 | https://www.inaturalist.org/observations/177852061 | 20.04.2023 |
| 11 | 45.9281105997 | 14.1949655 | https://www.inaturalist.org/observations/171164988 | 14.04.2023 |
| 12 | 47.3994888889 | 10.5764416667 | https://www.inaturalist.org/observations/170813626 | 01.07.2023 |
| 13 | 47.3913727225 | 8.2382209047 | https://www.inaturalist.org/observations/155178735 | 16.04.2023 |
| 14 | 45.9550219722 | 12.144133 | https://www.inaturalist.org/observations/153330677 | 03.04.2023 |
| 15 | 50.538097 | -3.640692 | https://www.inaturalist.org/observations/144166034 | 04.06.2021 |
| 16 | 45.3925167144 | 11.643473355 | https://www.inaturalist.org/observations/143888310 | 12.2022 |
| 17 | 45.945435 | 12.1375159722 | https://www.inaturalist.org/observations/140783896 | 01.11.2022 |
| 18 | 48.0074728867 | 16.2964932791 | https://www.inaturalist.org/observations/139546167 | 21.10.2022 |
| 19 | 45.5266220069 | 15.5939920619 | https://www.inaturalist.org/observations/122058589 | 16.06.2022 |
| 20 | 46.9455506051 | 15.5059294792 | https://www.inaturalist.org/observations/120648774 | 02.06.2022 |
| 21 | 48.3443343874 | 14.442711845 | https://www.inaturalist.org/observations/118769184 | 25.05.2022 |
| 22 | 49.4995752306 | 21.4915169028 | https://www.inaturalist.org/observations/118031737 | 21.05.2022 |
| 23 | 47.0967873298 | 15.4150763419 | https://www.inaturalist.org/observations/110483112 | 05.04.2022 |
| 24 | 45.2915763575 | 11.715566902 | https://www.inaturalist.org/observations/109358597 | 07.2021 |
| 25 | 48.9296491439 | 12.981306064 | https://www.inaturalist.org/observations/98953538 | 19.10.2021 |
| 26 | 45.3351249694 | 11.6746425628 | https://www.inaturalist.org/observations/95175357 | 17.09.2021 |
| 27 | 46.1062007292 | 12.3547636718 | https://www.inaturalist.org/observations/79012762 | 16.05.2021 |
| 28 | 48.1209281118 | 16.2226287994 | https://www.inaturalist.org/observations/70289592 | 05.06.2015 |
| 29 | 48.2434397573 | 16.268715823 | https://www.inaturalist.org/observations/67972384 | 02.06.2014 |
| 30 | 46.76521 | 2.42816 | <i>Haemopsis elegans</i> (Moquin-Tandon, 1846) in GBIF Secretariat (2023) | 15.07.2022 |
| 31 | 49.499575 | 21.491517 | <i>Haemopsis elegans</i> (Moquin-Tandon, 1846) in GBIF Secretariat (2023) | 21.05.2022 |
| 32 | 48.12938 | -0.58914 | <i>Haemopsis elegans</i> (Moquin-Tandon, 1846) in GBIF Secretariat (2023) | 16.09.2013 |
| 33 | 46.084 | 14.58581667 | Kvist <i>et al.</i> , 2023 | No data |
| 34 | 46.11116667 | 14.51078333 | Kvist <i>et al.</i> , 2023 | No data |
| 35 | 45.75451667 | 14.7119 | Kvist <i>et al.</i> , 2023 | No data |
| 36 | 49.829 | 24.061 | This research | 30.04.2022 |
| 37 | 48.08574 | -0.64283 | Lecaplain, Noël, 2019 | 04.12.2018 |
| 38 | 48.033533479 | 0.20459843 | Franck Noël | 2023 |
| 39 | 42.33639 | 21.80769 | Grosser, Pešić, 2006 | 30.04.2006 |
| 40 | 53.99851 | 13.89865 | Jueg, Zettler, 2015 | No data |
| 41 | 46.66 | 14.46 | Hassl, Kleewein, 2011 | 2005 |
| 42 | 49.02579 | 12.21173 | Grosser, 2004 | 18.04.2000 |
| 43 | 48.83318 | 11.74846 | Grosser, 2004 | 17.04.2000 |
| 44 | 53.71235 | 14.28553 | Grosser, 2004 | 17.07.2002 |

| | | | | |
|----|----------|---------|---------------|------------|
| 45 | 52.34848 | 12.9422 | Grosser, 2004 | 04.10.2002 |
| 46 | 52.356 | 12.985 | Grosser, 2004 | 04.10.2002 |
| 47 | 48.19 | 16.448 | Grosser, 2004 | 25.01.1994 |
| 48 | 48.208 | 16.256 | Grosser, 2004 | 17.07.2000 |
| 49 | 47.045 | 16.413 | Grosser, 2004 | 16.07.2000 |
| 50 | 46.050 | 14.475 | Grosser, 2004 | 29.05.2002 |

Table S2. List of set of MaxEnt models, and performance metric scores.

| | Combinations of features | Regularization multiplier | Log Likelihood | Parameters | Sample Size | AIC score | AICc score | BIC score | Δ AIC | Δ AICc | Δ BIC |
|----|--------------------------|---------------------------|----------------|------------|-------------|-----------|------------|-----------|--------------|---------------|--------------|
| 1 | auto | 1 | -602 | 36 | 50 | 1277 | 1482 | 1345 | 47 | 244 | 93 |
| 2 | H | 1 | -606 | 47 | 50 | 1306 | 3562 | 1396 | 76 | 2324 | 143 |
| 3 | HQ | 1 | -602 | 27 | 50 | 1259 | 1328 | 1310 | 29 | 90 | 58 |
| 4 | L | 1 | -623 | 8 | 50 | 1263 | 1266 | 1278 | 33 | 29 | 26 |
| 5 | LQ | 1 | -613 | 10 | 50 | 1245 | 1251 | 1264 | 16 | 13 | 12 |
| 6 | LQP | 1 | -603 | 12 | 50 | 1229 | 1238 | 1252 | 0 | 0 | 0 |
| 7 | LQT | 1 | -601 | 27 | 50 | 1256 | 1324 | 1307 | 26 | 87 | 55 |
| 8 | Q | 1 | -624 | 6 | 50 | 1260 | 1262 | 1272 | 31 | 25 | 20 |
| 9 | QHP | 1 | -600 | 32 | 50 | 1263 | 1387 | 1324 | 34 | 150 | 72 |
| 10 | QHT | 1 | -599 | 44 | 50 | 1286 | 2078 | 1370 | 57 | 840 | 118 |
| 11 | QHTP | 1 | -597 | 43 | 50 | 1280 | 1911 | 1362 | 51 | 673 | 110 |
| 12 | T | 1 | -605 | 30 | 50 | 1270 | 1368 | 1328 | 41 | 130 | 75 |
| 13 | auto | 2 | -610 | 16 | 50 | 1252 | 1269 | 1283 | 23 | 31 | 31 |
| 14 | H | 2 | -615 | 27 | 50 | 1285 | 1354 | 1336 | 55 | 116 | 84 |
| 15 | HQ | 2 | -611 | 16 | 50 | 1254 | 1271 | 1285 | 25 | 33 | 32 |
| 16 | L | 2 | -626 | 8 | 50 | 1268 | 1272 | 1284 | 39 | 34 | 31 |
| 17 | LQ | 2 | -616 | 9 | 50 | 1251 | 1255 | 1268 | 21 | 17 | 15 |
| 18 | LQP | 2 | -613 | 10 | 50 | 1246 | 1251 | 1265 | 16 | 14 | 13 |
| 19 | LQT | 2 | -614 | 13 | 50 | 1254 | 1264 | 1279 | 25 | 26 | 27 |
| 20 | Q | 2 | -626 | 7 | 50 | 1267 | 1269 | 1280 | 37 | 32 | 28 |
| 21 | QHP | 2 | -611 | 20 | 50 | 1262 | 1291 | 1300 | 32 | 53 | 48 |
| 22 | QHT | 2 | -611 | 18 | 50 | 1258 | 1280 | 1292 | 29 | 42 | 40 |
| 23 | QHTP | 2 | -611 | 21 | 50 | 1264 | 1297 | 1304 | 34 | 59 | 51 |
| 24 | T | 2 | -626 | 13 | 50 | 1277 | 1287 | 1302 | 48 | 49 | 50 |
| 25 | auto | 3 | -616 | 15 | 50 | 1262 | 1276 | 1291 | 33 | 38 | 38 |
| 26 | H | 3 | -622 | 25 | 50 | 1294 | 1348 | 1341 | 64 | 110 | 89 |
| 27 | HQ | 3 | -617 | 14 | 50 | 1263 | 1275 | 1290 | 33 | 37 | 37 |
| 28 | L | 3 | -629 | 6 | 50 | 1269 | 1271 | 1281 | 40 | 34 | 29 |
| 29 | LQ | 3 | -620 | 7 | 50 | 1254 | 1256 | 1267 | 24 | 18 | 15 |
| 30 | LQP | 3 | -621 | 9 | 50 | 1260 | 1265 | 1277 | 31 | 27 | 25 |
| 31 | LQT | 3 | -620 | 9 | 50 | 1257 | 1262 | 1274 | 28 | 24 | 22 |
| 32 | Q | 3 | -629 | 7 | 50 | 1271 | 1274 | 1285 | 42 | 36 | 32 |
| 33 | QHP | 3 | -619 | 14 | 50 | 1266 | 1278 | 1292 | 36 | 40 | 40 |
| 34 | QHT | 3 | -617 | 14 | 50 | 1263 | 1275 | 1290 | 33 | 37 | 37 |
| 35 | QHTP | 3 | -619 | 14 | 50 | 1266 | 1278 | 1292 | 36 | 40 | 40 |
| 36 | T | 3 | -637 | 8 | 50 | 1290 | 1294 | 1306 | 61 | 56 | 53 |
| 37 | auto | 4 | -621 | 13 | 50 | 1268 | 1278 | 1293 | 39 | 40 | 41 |
| 38 | H | 4 | -628 | 25 | 50 | 1305 | 1360 | 1353 | 76 | 122 | 101 |
| 39 | HQ | 4 | -622 | 14 | 50 | 1273 | 1285 | 1299 | 43 | 47 | 47 |
| 40 | L | 4 | -631 | 6 | 50 | 1273 | 1275 | 1285 | 44 | 37 | 32 |
| 41 | LQ | 4 | -623 | 7 | 50 | 1261 | 1263 | 1274 | 31 | 25 | 22 |
| 42 | LQP | 4 | -627 | 7 | 50 | 1267 | 1270 | 1281 | 38 | 32 | 28 |
| 43 | LQT | 4 | -623 | 7 | 50 | 1261 | 1263 | 1274 | 31 | 25 | 22 |
| 44 | Q | 4 | -631 | 7 | 50 | 1276 | 1278 | 1289 | 46 | 41 | 37 |
| 45 | QHP | 4 | -624 | 11 | 50 | 1270 | 1276 | 1291 | 40 | 39 | 38 |

| | | | | | | | | | | | |
|----|------|---|------|----|----|------|------|------|----|----|----|
| 46 | QHT | 4 | -622 | 13 | 50 | 1271 | 1281 | 1295 | 41 | 43 | 43 |
| 47 | QHTP | 4 | -624 | 11 | 50 | 1270 | 1276 | 1291 | 40 | 39 | 38 |
| 48 | T | 4 | -644 | 4 | 50 | 1296 | 1297 | 1304 | 67 | 60 | 52 |
| 49 | auto | 5 | -625 | 11 | 50 | 1271 | 1278 | 1292 | 42 | 40 | 40 |
| 50 | H | 5 | -632 | 13 | 50 | 1291 | 1301 | 1316 | 61 | 63 | 63 |
| 51 | HQ | 5 | -626 | 8 | 50 | 1268 | 1272 | 1284 | 39 | 34 | 31 |
| 52 | L | 5 | -632 | 4 | 50 | 1273 | 1274 | 1281 | 44 | 36 | 28 |
| 53 | LQ | 5 | -626 | 6 | 50 | 1263 | 1265 | 1275 | 34 | 28 | 23 |
| 54 | LQP | 5 | -630 | 5 | 50 | 1270 | 1272 | 1280 | 41 | 34 | 28 |
| 55 | LQT | 5 | -626 | 6 | 50 | 1263 | 1265 | 1275 | 34 | 28 | 23 |
| 56 | Q | 5 | -633 | 7 | 50 | 1280 | 1283 | 1293 | 51 | 45 | 41 |
| 57 | QHP | 5 | -628 | 14 | 50 | 1285 | 1297 | 1312 | 55 | 59 | 59 |
| 58 | QHT | 5 | -626 | 8 | 50 | 1268 | 1272 | 1284 | 39 | 34 | 31 |
| 59 | QHTP | 5 | -628 | 14 | 50 | 1285 | 1297 | 1312 | 55 | 59 | 59 |
| 60 | T | 5 | -648 | 3 | 50 | 1303 | 1303 | 1308 | 73 | 65 | 56 |

Table S3. Samples used for phylogenetic analysis.

| Species | Locality | Coordinates | Accession numbers | Reference |
|----------------------|--|-------------------------------|-------------------|------------------------------|
| <i>H. caballeroi</i> | Mexico City, Mexico | - | MK208625 | Kvist <i>et al.</i> 2023 |
| <i>H. caeca</i> | Movile Cave, Mangalia, Romania | 43°49'36.1"N, 28°33'42.4"E | AY040702 | Kvist <i>et al.</i> 2023 |
| <i>H. elegans</i> | park Pohulianka, Lviv, Ukraine | 49°49'44.4"N 24°03'39.6"E | PV210985 | This research |
| <i>H. elegans</i> | Argentré, France | 48°2' 0.72"N, 0°12'16.55"E | PV210986 | This research |
| <i>H. elegans</i> | Germany | - | EF125042 | Kutschera <i>et al.</i> 2007 |
| <i>H. elegans</i> | Gameljščica River, Ljubljana, Slovenia | 46°06.670'N, 14°30.647'E | OK447798 | Kvist <i>et al.</i> 2023 |
| <i>H. elegans</i> | Sava River, Ljubljana, Slovenia | 46°05.040'N, 14°35.149'E | OK447799 | Kvist <i>et al.</i> 2023 |
| <i>H. elegans</i> | Bistrica River, Ribnica, Slovenia | 45°45.271'N, 14°42.714'E | OK447837 | Kvist <i>et al.</i> 2023 |
| <i>H. grandis</i> | Manitoba, Canada | - | AY425447 | Kvist <i>et al.</i> 2023 |
| <i>H. grandis</i> | Restoule Lake, Restoule, Provincial Park, Ontario Canada | 46°03.636'N, 79°45.938'W | OK447813 | Kvist <i>et al.</i> 2023 |
| <i>H. grandis</i> | Lac Remi, Rene Brunelle Provincial Park, Ontario, Canada | 49°24.563'N, 82°07.972'W | OK447852 | Kvist <i>et al.</i> 2023 |
| <i>H. grandis</i> | Lac Remi, Rene Brunelle Provincial Park, Ontario, Canada | 49°24.563'N, 82°07.972'W | OK447853 | Kvist <i>et al.</i> 2023 |
| <i>H. grandis</i> | Lac Remi, Rene Brunelle Provincial Park, Ontario, Canada | 49°24.563'N, 82°07.972'W | OK447854 | Kvist <i>et al.</i> 2023 |
| <i>H. grandis</i> | Klotz Lake, Ontario, Canada | 49°47.956'N, 85°52.467'W | OK447859 | Kvist <i>et al.</i> 2023 |
| <i>H. grandis</i> | Klotz Lake, Ontario, Canada | 49°47.956'N, 85°52.467'W | OK447860 | Kvist <i>et al.</i> 2023 |
| <i>H. grandis</i> | Klotz Lake, Ontario, Canada | 49°47.956'N, 85°52.467'W | OK447861 | Kvist <i>et al.</i> 2023 |
| <i>H. grandis</i> | Klotz Lake, Ontario, Canada | 49°47.956'N, 85°52.467'W | OK447862 | Kvist <i>et al.</i> 2023 |
| <i>H. grandis</i> | Lac Jadot, Tee Lake, Quebec, Canada | 46°45.45'N, 79°02.765'W | OK447792 | Kvist <i>et al.</i> 2023 |
| <i>H. grandis</i> | Lac Jadot, Tee Lake, Quebec, Canada | 46°45.45'N, 79°02.765'W | OK447779 | Kvist <i>et al.</i> 2023 |
| <i>H. grandis</i> | Lac Jadot, Tee Lake, Quebec, Canada | 46°45.45'N, 79°02.765'W | OK447834 | Kvist <i>et al.</i> 2023 |
| <i>H. grandis</i> | Sandy Bay, E of Lake Winnipeg, Manitoba, Canada | 50°43.371'N, 96°32.349'W | OK447838 | Kvist <i>et al.</i> 2023 |
| <i>H. grandis</i> | Cushing Lake, Ontario, Canada | 48°40.001'N, 88°43.358'W | OK447864 | Kvist <i>et al.</i> 2023 |
| <i>H. grandis</i> | Lac Levêque, Quebec, Canada | 47°52.164'N, 78°59.958'W | OK447828 | Kvist <i>et al.</i> 2023 |
| <i>H. kingi</i> | Long Lake, Long Lake Provincial Park, Alberta, Canada | 54°26.595'N, 112°45.968'W | OK447806 | Kvist <i>et al.</i> 2023 |
| <i>H. kingi</i> | Long Lake, Long Lake Provincial Park, Alberta, Canada | 54°26.595'N, 112°45.968'W | OK447849 | Kvist <i>et al.</i> 2023 |
| <i>H. kingi</i> | Half Moon Lake, E of Edmonton, Alberta, Canada | 53°27.351'N, 113°05.010'W | OK447836 | Kvist <i>et al.</i> 2023 |
| <i>H. kingi</i> | Half Moon Lake, E of Edmonton, Alberta, Canada | 53°27.351'N, 113°05.010'W | OK447796 | Kvist <i>et al.</i> 2023 |
| <i>H. kingi</i> | Half Moon Lake, E of Edmonton, Alberta, Canada | 53°27.351'N, 113°05.010'W | OK447835 | Kvist <i>et al.</i> 2023 |
| <i>H. kingi</i> | Half Moon Lake, E of Edmonton, Alberta, Canada | 53°27.351'N, 113°05.010'W | OK447797 | Kvist <i>et al.</i> 2023 |
| <i>H. kingi</i> | Jasper National Park, Alberta, Canada | - | KM612209 | Kvist <i>et al.</i> 2023 |
| <i>H. kingi</i> | Jasper National Park, Alberta, | - | KM612178 | Kvist <i>et al.</i> 2023 |

| Canada | | | | |
|--------------------------|---|------------------------------|----------|--------------------------|
| <i>H. kingi</i> | Jasper National Park, Alberta, Canada | - | KM611858 | Kvist <i>et al.</i> 2023 |
| <i>H. kingi</i> | Dog Lake, Kootenay National Park, British Columbia, Canada | - | KM612218 | Kvist <i>et al.</i> 2023 |
| <i>H. kingi</i> | Burnt Cabin Bog Ecological Reserve, British Columbia, Canada | - | MG423499 | Kvist <i>et al.</i> 2023 |
| <i>H. kingi</i> | Burnt Cabin Bog Ecological Reserve, British Columbia, Canada | - | MG422075 | Kvist <i>et al.</i> 2023 |
| <i>H. kingi</i> | Yoho National Park, British Columbia, Canada | - | KM611881 | Kvist <i>et al.</i> 2023 |
| <i>H. kingi</i> | Anglin Lake, Great Blue Heron Provincial Park, Saskatchewan, Canada | 53°42.943'N, 105°56.548'W | OK447839 | Kvist <i>et al.</i> 2023 |
| <i>H. kingi</i> | Elk Island National Park, Alberta, Canada | - | KM612231 | Kvist <i>et al.</i> 2023 |
| <i>H. kingi</i> | Little Kenosee Lake, Moose Mountain Provincial Park, Saskatchewan, Canada | 49°49.488'N, 102°20.778'W | OK447842 | Kvist <i>et al.</i> 2023 |
| <i>H. kingi</i> | Chump Lake, Alberta, Canada | 54°39.051'N, 112°33.681'W | OK447845 | Kvist <i>et al.</i> 2023 |
| <i>H. kingi</i> | Manitoba, Canada | - | AY425448 | Kvist <i>et al.</i> 2023 |
| <i>H. kingi</i> | Unnamed pond outside of Lakelands Provincial Park, Alberta, Canada | 54°46.665'N, 111°42.660'W | OK447846 | Kvist <i>et al.</i> 2023 |
| <i>H. lateromaculata</i> | Michigan, USA | - | AF116028 | Kvist <i>et al.</i> 2023 |
| <i>H. marmorata</i> | Lac Levêque, Quebec, Canada | 47°52.164'N, 78°59.958'W | OK447764 | Kvist <i>et al.</i> 2023 |
| <i>H. marmorata</i> | Lac Levêque, Quebec, Canada | 47°52.164'N, 78°59.958'W | OK447827 | Kvist <i>et al.</i> 2023 |
| <i>H. marmorata</i> | Lac Levêque, Quebec, Canada | 47°52.164'N, 78°59.958'W | OK447826 | Kvist <i>et al.</i> 2023 |
| <i>H. marmorata</i> | Lac Levêque, Quebec, Canada | 47°52.164'N, 78°59.958'W | OK447825 | Kvist <i>et al.</i> 2023 |
| <i>H. marmorata</i> | Lac Levêque, Quebec, Canada | 47°52.164'N, 78°59.958'W | OK447824 | Kvist <i>et al.</i> 2023 |
| <i>H. marmorata</i> | Lac Levêque, Quebec, Canada | 47°52.164'N, 78°59.958'W | OK447829 | Kvist <i>et al.</i> 2023 |
| <i>H. marmorata</i> | Lac Levêque, Quebec, Canada | 47°52.164'N, 78°59.958'W | OK447765 | Kvist <i>et al.</i> 2023 |
| <i>H. marmorata</i> | Little Kenosee Lake, Moose Mountain Provincial Park, Saskatchewan, Canada | 49°49.488'N, 102°20.778'W | OK447841 | Kvist <i>et al.</i> 2023 |
| <i>H. marmorata</i> | Little Kenosee Lake, Moose Mountain Provincial Park, Saskatchewan, Canada | 49°49.488'N, 102°20.778'W | OK447840 | Kvist <i>et al.</i> 2023 |
| <i>H. marmorata</i> | Wellmans Lake, Duck Mountain Provincial Park, Manitoba, Canada | 51°48.735'N, 100°53.765'W | OK447802 | Kvist <i>et al.</i> 2023 |
| <i>H. marmorata</i> | Wellmans Lake, Duck Mountain Provincial Park, Manitoba, Canada | 51°48.735'N, 100°53.765'W | OK447801 | Kvist <i>et al.</i> 2023 |
| <i>H. marmorata</i> | Sandy Bay, E of Lake Winnipeg, Manitoba, Canada | 50°43.371'N, 96°32.349'W | OK447805 | Kvist <i>et al.</i> 2023 |
| <i>H. marmorata</i> | Fish Lake, W of Klotz Lake, Ontario, Canada | 49°48.027'N, 85°48.218'W | OK447858 | Kvist <i>et al.</i> 2023 |
| <i>H. marmorata</i> | Fish Lake, W of Klotz Lake, Ontario, Canada | 49°48.027'N, 85°48.218'W | OK447857 | Kvist <i>et al.</i> 2023 |
| <i>H. marmorata</i> | Fish Lake, W of Klotz Lake, Ontario, Canada | 49°48.027'N, 85°48.218'W | OK447856 | Kvist <i>et al.</i> 2023 |
| <i>H. marmorata</i> | Cantin Lake, W of Moonbeam, Ontario, Canada | 49°20.485'N, 82°10.686'W | OK447855 | Kvist <i>et al.</i> 2023 |
| <i>H. marmorata</i> | Cushing Lake, Ontario, Canada | 48°40.001'N, 88°43.358'W | OK447863 | Kvist <i>et al.</i> 2023 |
| <i>H. marmorata</i> | Cushing Lake, Ontario, Canada | 48°40.001'N, 88°43.358'W | OK447865 | Kvist <i>et al.</i> 2023 |

| | | | | |
|---------------------|--|-----------------------------|----------|--------------------------|
| <i>H. marmorata</i> | Lake Mijinemungshing, Lake Superior Provincial Park, Ontario, Canada | 47°42.167'N, 84°43.816'W | OK447816 | Kvist <i>et al.</i> 2023 |
| <i>H. marmorata</i> | Lake Mijinemungshing, Lake Superior Provincial Park, Ontario, Canada | 47°42.167'N, 84°43.816'W | OK447815 | Kvist <i>et al.</i> 2023 |
| <i>H. marmorata</i> | Lake Mijinemungshing, Lake Superior Provincial Park, Ontario, Canada | 47°42.167'N, 84°43.816'W | OK447850 | Kvist <i>et al.</i> 2023 |
| <i>H. marmorata</i> | Ranger Lake, Lake Superior Provincial Park, Ontario, Canada | 46°52.733'N, 83°34.136'W | OK447814 | Kvist <i>et al.</i> 2023 |
| <i>H. marmorata</i> | Lac Jadot, Tee Lake, Quebec, Canada | 46°45.45'N, 79°02.765'W | OK447791 | Kvist <i>et al.</i> 2023 |
| <i>H. marmorata</i> | Lac Jadot, Tee Lake, Quebec, Canada | 46°45.45'N, 79°02.765'W | OK447790 | Kvist <i>et al.</i> 2023 |
| <i>H. marmorata</i> | Lac Jadot, Tee Lake, Quebec, Canada | 46°45.45'N, 79°02.765'W | OK447786 | Kvist <i>et al.</i> 2023 |
| <i>H. marmorata</i> | Lac Jadot, Tee Lake, Quebec, Canada | 46°45.45'N, 79°02.765'W | OK447832 | Kvist <i>et al.</i> 2023 |
| <i>H. marmorata</i> | Lac Jadot, Tee Lake, Quebec, Canada | 46°45.45'N, 79°02.765'W | OK447782 | Kvist <i>et al.</i> 2023 |
| <i>H. marmorata</i> | Lac Jadot, Tee Lake, Quebec, Canada | 46°45.45'N, 79°02.765'W | OK447781 | Kvist <i>et al.</i> 2023 |
| <i>H. marmorata</i> | Lac Jadot, Tee Lake, Quebec, Canada | 46°45.45'N, 79°02.765'W | OK447773 | Kvist <i>et al.</i> 2023 |
| <i>H. marmorata</i> | Lac Jadot, Tee Lake, Quebec, Canada | 46°45.45'N, 79°02.765'W | OK447771 | Kvist <i>et al.</i> 2023 |
| <i>H. marmorata</i> | Lac Jadot, Tee Lake, Quebec, Canada | 46°45.45'N, 79°02.765'W | OK447784 | Kvist <i>et al.</i> 2023 |
| <i>H. marmorata</i> | Lac Jadot, Tee Lake, Quebec, Canada | 46°45.45'N, 79°02.765'W | OK447787 | Kvist <i>et al.</i> 2023 |
| <i>H. marmorata</i> | Lac Jadot, Tee Lake, Quebec, Canada | 46°45.45'N, 79°02.765'W | OK447851 | Kvist <i>et al.</i> 2023 |
| <i>H. marmorata</i> | Lac Jadot, Tee Lake, Quebec, Canada | 46°45.45'N, 79°02.765'W | OK447795 | Kvist <i>et al.</i> 2023 |
| <i>H. marmorata</i> | Lac Jadot, Tee Lake, Quebec, Canada | 46°45.45'N, 79°02.765'W | OK447785 | Kvist <i>et al.</i> 2023 |
| <i>H. marmorata</i> | Lac Jadot, Tee Lake, Quebec, Canada | 46°45.45'N, 79°02.765'W | OK447776 | Kvist <i>et al.</i> 2023 |
| <i>H. marmorata</i> | Lac Jadot, Tee Lake, Quebec, Canada | 46°45.45'N, 79°02.765'W | OK447774 | Kvist <i>et al.</i> 2023 |
| <i>H. marmorata</i> | Lac Jadot, Tee Lake, Quebec, Canada | 46°45.45'N, 79°02.765'W | OK447794 | Kvist <i>et al.</i> 2023 |
| <i>H. marmorata</i> | Lac Jadot, Tee Lake, Quebec, Canada | 46°45.45'N, 79°02.765'W | OK447793 | Kvist <i>et al.</i> 2023 |
| <i>H. marmorata</i> | Lac Jadot, Tee Lake, Quebec, Canada | 46°45.45'N, 79°02.765'W | OK447789 | Kvist <i>et al.</i> 2023 |
| <i>H. marmorata</i> | Lac Jadot, Tee Lake, Quebec, Canada | 46°45.45'N, 79°02.765'W | OK447788 | Kvist <i>et al.</i> 2023 |
| <i>H. marmorata</i> | Lac Jadot, Tee Lake, Quebec, Canada | 46°45.45'N, 79°02.765'W | OK447833 | Kvist <i>et al.</i> 2023 |
| <i>H. marmorata</i> | Lac Jadot, Tee Lake, Quebec, Canada | 46°45.45'N, 79°02.765'W | OK447778 | Kvist <i>et al.</i> 2023 |
| <i>H. marmorata</i> | Lac Jadot, Tee Lake, Quebec, Canada | 46°45.45'N, 79°02.765'W | OK447777 | Kvist <i>et al.</i> 2023 |
| <i>H. marmorata</i> | Lac Jadot, Tee Lake, Quebec, Canada | 46°45.45'N, 79°02.765'W | OK447775 | Kvist <i>et al.</i> 2023 |
| <i>H. marmorata</i> | Lac Jadot, Tee Lake, Quebec, Canada | 46°45.45'N, 79°02.765'W | OK447772 | Kvist <i>et al.</i> 2023 |
| <i>H. marmorata</i> | Lac Jadot, Tee Lake, Quebec, Canada | 46°45.45'N, 79°02.765'W | OK447831 | Kvist <i>et al.</i> 2023 |
| <i>H. marmorata</i> | Lac Jadot, Tee Lake, Quebec, Canada | 46°45.45'N, 79°02.765'W | OK447780 | Kvist <i>et al.</i> 2023 |
| <i>H. marmorata</i> | Lac Jadot, Tee Lake, Quebec, Canada | 46°45.45'N, 79°02.765'W | OK447783 | Kvist <i>et al.</i> 2023 |

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| | | 79°02.765'W | | |
| <i>H. marmorata</i> | Lac Jadot, Tee Lake, Quebec, Canada | 46°45.45'N, 79°02.765'W | OK447770 | Kvist <i>et al.</i> 2023 |
| <i>H. marmorata</i> | Lac Pian, Quebec, Canada | 47°51.442'N, 79°06.838'W | OK447766 | Kvist <i>et al.</i> 2023 |
| <i>H. marmorata</i> | Lac Boutin, W of Grand lac des Cèdres, Quebec, Canada | 46°16.803'N, 76°05.569'W | OK447821 | Kvist <i>et al.</i> 2023 |
| <i>H. marmorata</i> | Lac Boutin, W of Grand lac des Cèdres, Quebec, Canada | 46°16.803'N, 76°05.569'W | OK447820 | Kvist <i>et al.</i> 2023 |
| <i>H. marmorata</i> | Lac Boutin, W of Grand lac des Cèdres, Quebec, Canada | 46°16.803'N, 76°05.569'W | OK447817 | Kvist <i>et al.</i> 2023 |
| <i>H. marmorata</i> | Lac Boutin, W of Grand lac des Cèdres, Quebec, Canada | 46°16.803'N, 76°05.569'W | OK447819 | Kvist <i>et al.</i> 2023 |
| <i>H. marmorata</i> | Lac Boutin, W of Grand lac des Cèdres, Quebec, Canada | 46°16.803'N, 76°05.569'W | OK447818 | Kvist <i>et al.</i> 2023 |
| <i>H. marmorata</i> | Lac du Gabbro, Zec Capitachouane, Quebec, Canada | 47°36.917'N, 77°13.748'W | OK447823 | Kvist <i>et al.</i> 2023 |
| <i>H. marmorata</i> | Lac du Gabbro, Zec Capitachouane, Quebec, Canada | 47°36.917'N, 77°13.748'W | OK447822 | Kvist <i>et al.</i> 2023 |
| <i>H. marmorata</i> | Half Moon Lake, E of Edmonton, Alberta, Canada | 53°27.351'N, 113°05.010'W | OK447807 | Kvist <i>et al.</i> 2023 |
| <i>H. marmorata</i> | Charlottetown, NL, Canada | 48°29.526'N, 54°01.338'W | HQ946099 | Kvist <i>et al.</i> 2023 |
| <i>H. marmorata</i> | Unnamed pond, NE of Remigny, Quebec, Canada | 47°48.487'N, 79°09.842'W | OK447830 | Kvist <i>et al.</i> 2023 |
| <i>H. marmorata</i> | Unnamed pond, NE of Remigny, Quebec, Canada | 47°48.487'N, 79°09.842'W | OK447767 | Kvist <i>et al.</i> 2023 |
| <i>H. marmorata</i> | Unnamed pond, NE of Remigny, Quebec, Canada | 47°48.487'N, 79°09.842'W | OK447769 | Kvist <i>et al.</i> 2023 |
| <i>H. marmorata</i> | Unnamed pond, NE of Remigny, Quebec, Canada | 47°48.487'N, 79°09.842'W | OK447768 | Kvist <i>et al.</i> 2023 |
| <i>H. marmorata</i> | Unnamed pond N of Algonquin Provincial Park, Ontario, Canada | 46°09.598'N, 78°19.410'W | OK447812 | Kvist <i>et al.</i> 2023 |
| <i>H. marmorata</i> | Unnamed pond N of Algonquin Provincial Park, Ontario, Canada | 46°09.598'N, 78°19.410'W | OK447811 | Kvist <i>et al.</i> 2023 |
| <i>H. marmorata</i> | Unnamed pond outside of Lakelands Provincial Park, Alberta, Canada | 54°46.665'N, 111°42.660'W | OK447848 | Kvist <i>et al.</i> 2023 |
| <i>H. marmorata</i> | Unnamed pond outside of Lakelands Provincial Park, Alberta, Canada | 54°46.665'N, 111°42.660'W | OK447847 | Kvist <i>et al.</i> 2023 |
| <i>H. marmorata</i> | Unnamed pond, E of Lesser Slave Lake, Alberta, Canada | 55°19.917'N, 114°43.303'W | OK447844 | Kvist <i>et al.</i> 2023 |
| <i>H. marmorata</i> | Unnamed pond, E of Lesser Slave Lake, Alberta, Canada | 55°19.917'N, 114°43.303'W | OK447843 | Kvist <i>et al.</i> 2023 |
| <i>H. marmorata</i> | Unnamed Pond, W of Lake Vermillion, Minnesota, USA | 47°50.961'N, 92°31.630'W | OK447809 | Kvist <i>et al.</i> 2023 |
| <i>H. marmorata</i> | Unnamed Pond, W of Lake Vermillion, Minnesota, USA | 47°53.331'N, 92°30.324'W | OK447808 | Kvist <i>et al.</i> 2023 |
| <i>H. marmorata</i> | Mud Lake, Minnesota, USA | 47°52.486'N, 92°08.445'W | OK447810 | Kvist <i>et al.</i> 2023 |
| <i>H. marmorata</i> | Camden, NJ, USA | - | FJ897515 | Kvist <i>et al.</i> 2023 |
| <i>H. marmorata</i> | USA | - | AF003270 | Kvist <i>et al.</i> 2023 |
| <i>H. septagon</i> (= <i>H. ottorum</i>) | Pomona, NJ, USA | - | FJ897513 | Kvist <i>et al.</i> 2023 |
| <i>H. septagon</i> (= <i>H. ottorum</i>) | Alloway, NJ, USA | - | FJ897510 | Kvist <i>et al.</i> 2023 |
| <i>H. septagon</i> (= <i>H. ottorum</i>) | Winslow, NJ, USA | - | FJ897512 | Kvist <i>et al.</i> 2023 |
| <i>H. plumbea</i> | Adams Lake, Turtle Mountain Provincial Park, Manitoba, Canada | 49°02.607'N, 100°03.631'W | OK447804 | Kvist <i>et al.</i> 2023 |
| <i>H. plumbea</i> | Adams Lake, Turtle Mountain Provincial Park, Manitoba, Canada | 49°02.607'N, 100°03.631'W | OK447803 | Kvist <i>et al.</i> 2023 |
| <i>H. sanguisuga</i> | Dohitianets River, Vinnytsia, Ukraine | 49°12.980'N, 28°25.960' E | PV210987 | This research |

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| <i>H. sanguisuga</i> | Svart Arn, Sweden | - | AF462021 | Kvist <i>et al.</i> 2023 |
| <i>H. sanguisuga</i> | Glinščica River, Ljubljana, Slovenia | 46°02.941'N, 14°28.586'E | OK447800 | Kvist <i>et al.</i> 2023 |
| <i>H. sanguisuga</i> | Serbia | - | KP663470 | Kvist <i>et al.</i> 2023 |
| <i>H. sanguisuga</i> | Serbia | - | KP663469 | Kvist <i>et al.</i> 2023 |
| <i>Haemopsis</i> sp. | Pukaskwa National Park, Ontario, Canada | - | KM611897 | Kvist <i>et al.</i> 2023 |
| <i>Haemopsis</i> sp. | Riding Mountain National Park, Manitoba, Canada | - | KM611885 | Kvist <i>et al.</i> 2023 |
| <i>Haemopsis</i> sp. | Elk Island National Park, Alberta, Canada | - | KM612038 | Kvist <i>et al.</i> 2023 |
| <i>Haemopsis</i> sp. | Elk Island National Park, Alberta, Canada | - | KM611959 | Kvist <i>et al.</i> 2023 |
| <i>H. terrestris</i> | Missouri, USA | - | FJ897514 | Kvist <i>et al.</i> 2023 |
| <i>H. terrestris</i> | Ohio, USA | - | AY786459 | Kvist <i>et al.</i> 2023 |
| <i>H. terrestris</i> | Ohio, USA | - | EU100092 | Kvist <i>et al.</i> 2023 |
| <i>Hirudinaria manillensis</i> | - | - | OR578883 | Meng 2023 (GenBank) |

Table S4. Estimates of relative contributions of the environmental variables to the Maxent model.

| Variable | Percent contribution | Permutation importance |
|----------------------|----------------------|------------------------|
| wc2.1_2.5m_eu_bio_14 | 31.3 | 30.4 |
| wc2.1_2.5m_eu_bio_8 | 21.7 | 7.8 |
| wc2.1_2.5m_eu_bio_6 | 18.2 | 30.8 |
| wc2.1_2.5m_eu_bio_2 | 14.4 | 0.2 |
| wc2.1_2.5m_eu_elev | 6.5 | 17.8 |
| wc2.1_2.5m_eu_bio_19 | 4.8 | 3.4 |
| wc2.1_2.5m_eu_bio_15 | 2.4 | 6.9 |
| wc2.1_2.5m_eu_bio_7 | 0.6 | 2.7 |

Figure S1. Response curves.

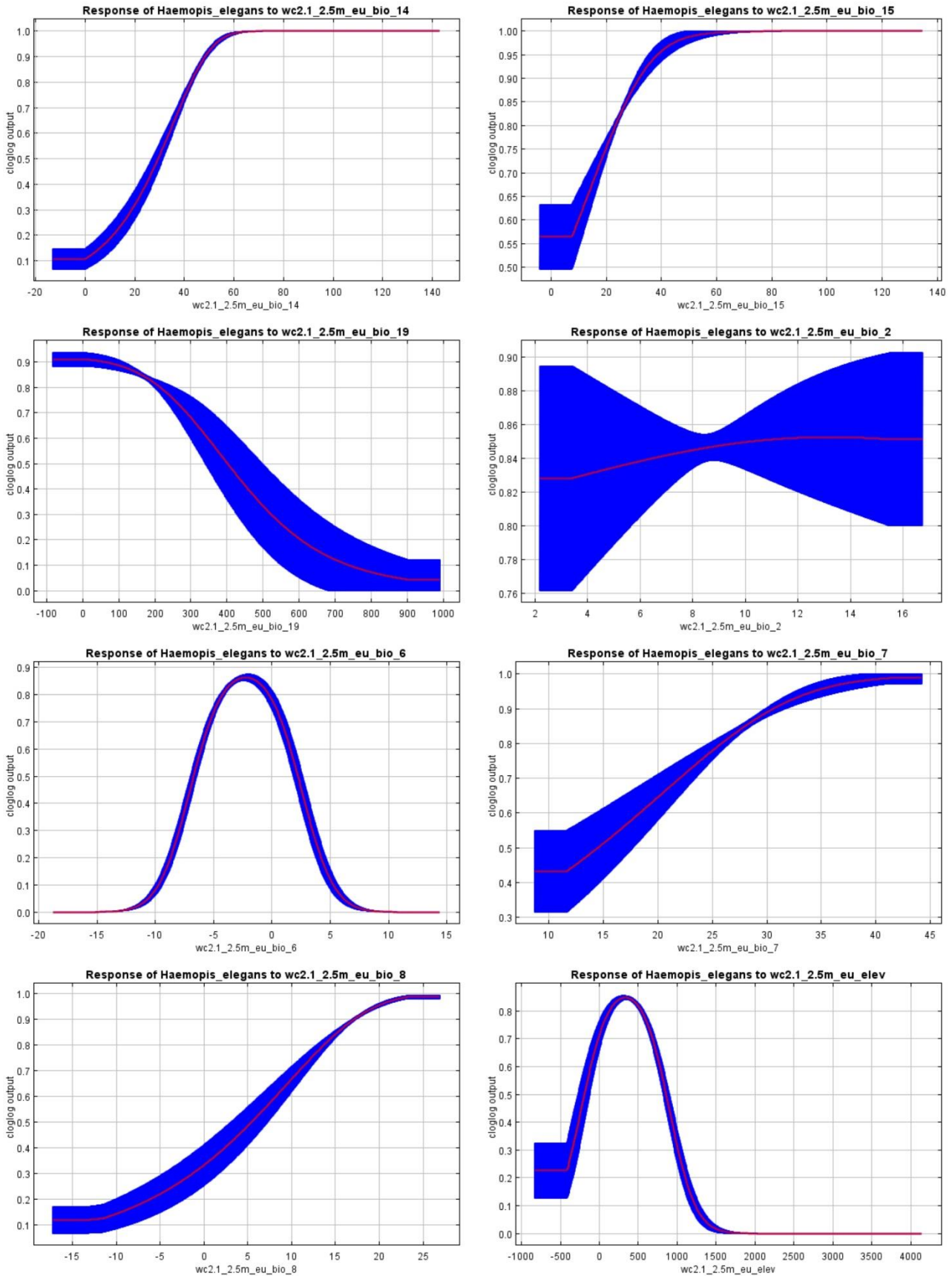


Figure S2. The results of the jackknife test of variable importance.

